[0031] A resistive touch sensor with light control, according to the example embodiment of **FIG. 5**A, includes two transparent conductive layers **510**, **520** with a gap **530** interposed between the conductive layers **510**, **520**. The conductive layers **510**, **520** may include a transparent conductive oxide such as indium tin oxide (ITO), antimony tin oxide (ATO), tin oxide (TO), or any other suitable transparent conductive materials, including conductive polymers.

[0032] Either (or both) flexible superstrate **540** or substrate **550** can incorporate a light control film so that the light control film forms a structural element of the resistive touch sensor, and in the case of superstrate **540** can also provide the touch surface. For example, superstrate **540** can be provided as a flexible, micro-louvered film that provides a touch surface as well as being the structural element upon which a first conductive layer **510** is deposited. The second conductive layer **520** is disposed on substrate **550**, which also forms a structural element of the sensor. The substrate **550** may be formed of any suitable flexible or rigid material, such as glass or plastic, and can also include light control functionality. One or more spacers **560** may be positioned within the gap layer **530** to maintain an appropriate spacing between the conductive layers **510**, **520**.

[0033] Electrical contact to the conductive layers of the touch sensor may be provided by a discrete wire harness (not shown) coupling the touch sensor to a controller (not shown).

[0034] **FIG. 5B** illustrates a touch sensor based on a capacitive touch sensing technology and incorporating light control in accordance with an embodiment of the invention. In this example, a substrate **565** provides the structural support for the capacitive touch sensor.

[0035] The substrate **565** supports a conductive layer **570** disposed thereon. A resistor pattern (not shown) may be screen printed or otherwise formed on the conductive layer **570** to linearize the electric field applied by the touch sensor controller (not shown) across the touch sensor surface. A dielectric layer **575** is disposed on the conductive layer. Conductive touch objects can be coupled to the conductive layer **570** through dielectric layer **575** when placed in sufficient proximity to the conductive layer (for example, when contacting the dielectric layer), thereby drawing a current that can be measured to determine the position of the touch object. Additional layers may be applied to the dielectric layer **575** such as protective coatings, antiglare coatings, or the like. Substrate **565** can incorporate a light control film so that the light control film forms a structural element of the sensor. Also, dielectric layer **575** can incorporate a light control film so that the light control film provides the touch surface of the sensor.

[0036] **FIG. 5C** illustrates a further embodiment using a light control film as a structural element or as a touch surface of a projected capacitive touch sensor that incorporates a plurality of conductive objects, such as wires, bars, or traces, arranged in pattern such as a grid or in a series of parallel lines. Without loss of generality, this embodiment is described employing near field imaging (NFI) touch sensing technology.

[0037] NFI touch sensors use a series of transparent conductive bars disposed on a non-conductive substrate to sense a touch. Typically, the touch is sensed through a dielectric medium, which may itself be the sensor substrate. The non-conductive substrate may be comprised of glass or plastic, for example, and may be rigid or flexible. If a separate dielectric medium is provided, it can be disposed over the conductor bars on a side opposing the substrate. The dielectric medium can be a coating or a glass or film overlay. The transparent conductor may be formed of a suitable metal oxide, such as ITO or ATO, or a conductive polymer deposited on the substrate. An AC signal applied to the conductive pattern creates an electrostatic field at the surface of the touch sensor. When a finger or other implement contacts the touch screen surface, the electrostatic field is disturbed and a touch is detected. In the example embodiment illustrated in **FIG. 5**C, substrate **585** provides structural support for the patterned transparent conductive bars **595**, and dielectric overlay **590** provides the touch surface through which conductive touch objects are coupled. Either substrate **585** or overlay **590** can incorporate a light control film to control the directional viewability through the touch sensor.

[0038] According to an example embodiment of the invention, a touch sensor that employs force technology for detection of the touch location can use a touch surface that incorporates an optical control layer. Signals representing the force of a touch acting on the touch screen are produced by one or more force transducers coupled to the touch surface of the touch sensor. Determination of the touch location involves analyzing the transducer signals.

[0039] In the configuration illustrated in **FIG. 6**A, an overlay **610**, preferably a rigid overlay, can incorporate a light control film such as a micro-louvered film, for example laminated or otherwise permanently affixed to a rigid or semi-rigid glass or plastic substrate. Alternatively, a rigid or semi-rigid light control element can be used as the overlay **610** without lamination to other layers. Overlay **610** can also form the touch surface **605** of the touch sensor. A force applied to the touch surface **605** passes through to a plurality of force transducers **630** which may be located, for example, at the corners of the overlay **610**. The location of the touch is determined by analyzing the signal produced by the force transducers **630**. Overlay **610** is a structural element of the sensor **600**A.

[0040] According to a further embodiment of the invention, touch sensing technologies employing transducers positioned on top of the touch surface, such as with surface acoustic wave (SAW) and infrared (IR) touch sensors, may be used to implement the light control techniques of the present invention.

[0041] A SAW touch screen is implemented using a rigid touch surface, such as glass.

[0042] Surface acoustic waves are transmitted across the surface of the touch surface by SAW emitters, a series of reflectors, a series of collectors, and SAW detectors. Typically, one set of a SAW emitter, a series of reflectors, a series of collectors, and a SAW detector is used to determine the "x" axis touch location and another set of a SAW emitter, a series of reflectors, a series of collectors, and a SAW detector is used to determine the "y" axis touch location. When a finger or other touch implement is applied to the touch surface, acoustic wave energy can be absorbed. Detector circuitry senses the dip in energy and calculates the touch position.